



Tuning Status – what do we do before we turn it on?

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Simulations that have been done

- Generate data with simulated problems and check tuning procedure - done several times
- Heritage – used with HIRS by New Zealand, U.S. and ECMWF
- Recent simulations
 - Recovery of frequency shifted AIRS is excellent
 - Microwave simulations have no pattern – error is random
- Have not simulated getting data from just radiosondes
- Missing part
 - “Truth” has to completely specify the profile for a radiative transfer calculation
 - Radiosondes only specify part of what is needed



Tuning

- Purpose
 - Remove systematic bias from retrievals
 - Biases caused by errors in
 - Radiative transfer
 - Match up
 - “truth”
 - Other?
 - Remember to do no harm
 - Corrections are calculated and applied only where needed
 - Radiances remain as measured
 - Match system can do 2 retrievals - one adjusted and 1 raw
 - Iterative cloud clearing?



Tuning

- Approach
 - Collect pairs of measured and calculated radiances
 - Calculation procedure will be covered separately
 - Major Predictors are the measured radiances
 - In simulations, no other predictors are required
 - Ten possible additional predictors are allowed
 - Location, solar zenith angle, time of day, other?
 - Unknown before launch – many are instrument related
 - Not needed for a perfect instrument
 - Generate regression coefficients to predict the difference as a function of the measured radiances
 - Measured should change less than calculated – complicated by cloud clearing
 - Suppress off-diagonal elements as necessary
 - Smooth transition from bias only to removal of all systematic effects



Tuning – radiosonde extension

- Radiosonde data need to be supplemented for radiative transfer
- Use retrieval for surface skin temperature
 - Best available over land – note need radiance, not temperature
- Predict upper levels from the measured radiances
 - Use synthetic regression
 - Same profiles for all conditions
 - Change only angle dependent quantities - emissivity
 - Preserves the radiative transfer relationship
 - For some parameter in some regions, AIRS is the best estimate - if it ain't broke, don't fix it
 - Smooth the profile over the transition
 - Weight over several layers
 - Or predict upper missing levels from the present ones and weight by noise
 - Weight is the proportional to $1/\text{noise squared}$

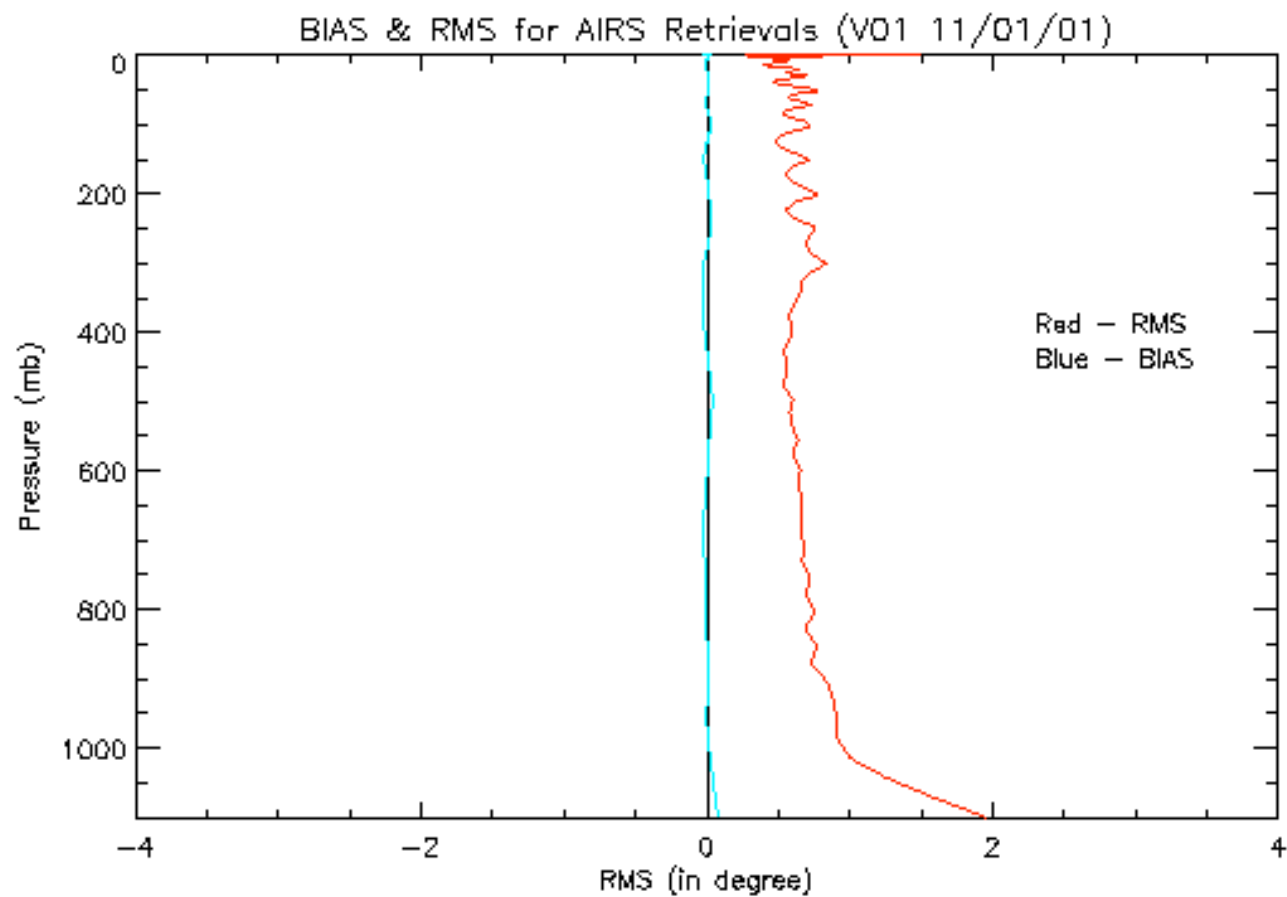


Tuning – radiosonde extension continued

- Use the team retrieval for the extension
 - Has many positives
 - Cautions
 - Team regression guess may be based on matches rather than calculations
 - If so, then the same filling problem occurred there and something was done
 - A potential feedback cycle is created
 - tuning is used for retrievals
 - Retrievals are used to fill upper atmosphere
 - Next tuning is based on retrievals
- Use the team retrieval, but have the regression in place as a backup

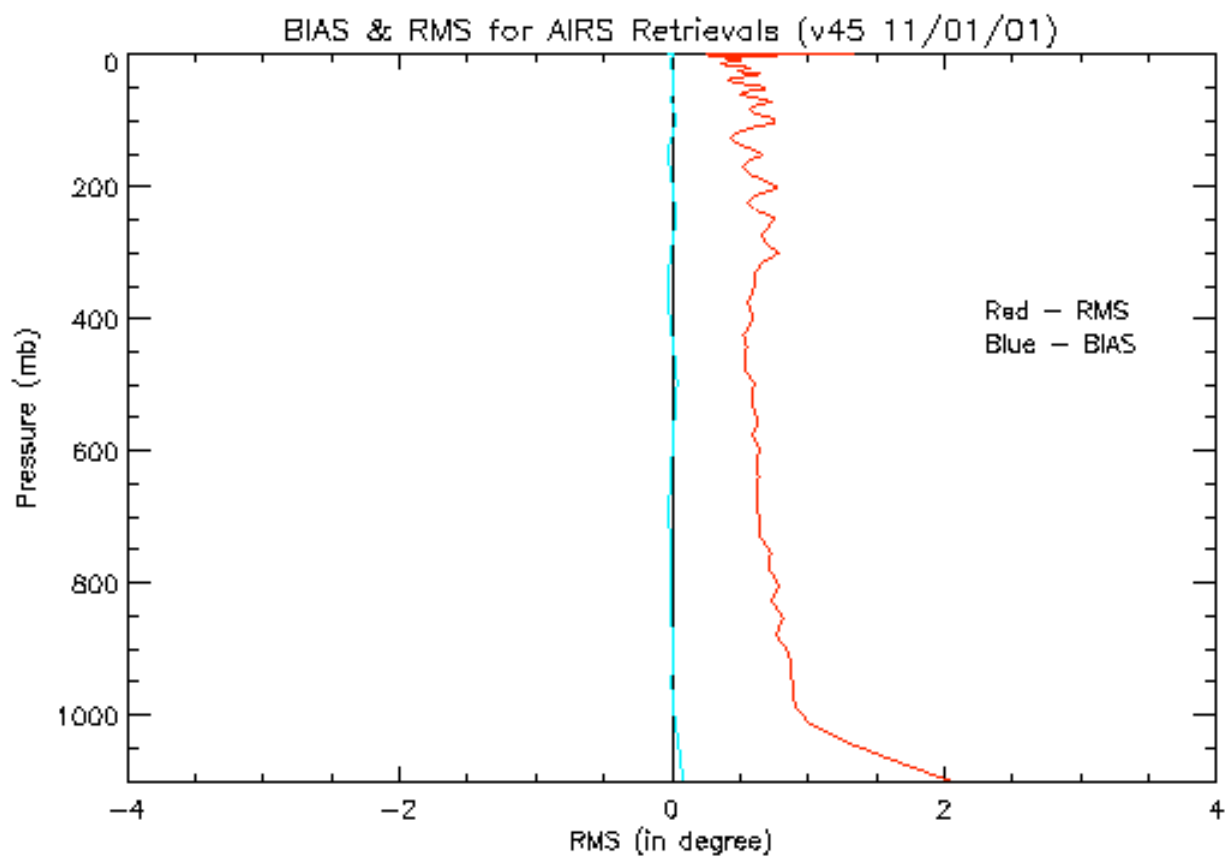


Retrieval for scan positions 45/46





Retrieval for scan positions 1/90





Predicted from lower levels below 33

